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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
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09/457,929 12/08/99 YAO

J A-64873-1/AJ

EXAMINER

IM22/0904

LUND, J

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ART UNIT

PAPER NUMBER

1763

12

DATE MAILED:

09/04/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

| | | | |
|-----------------------|-------------------------------|----------------------------|--|
| Office Action Summary | Application No. 09/457,929 | Applicant(s) YAO ET AL. | |
| | Examiner Jeffrie R. Lund | Art Unit 1763 | |

-- Th MAILING DATE of this communication appears on the cov r sheet with th corr spondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09/457,929.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6,8-12 and 24-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8-12 and 24-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

Specification

1. The amendment filed 8/28/01 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "an isotropic" in the paragraph beginning on page 7 line 3.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Objections

2. Claim 26 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 26 requires that the coefficient expansion in the range of 2.6×10^{-6} to $5 \times 10^{-6} / ^\circ\text{C}$, this same limitation is required by claim 25 from which claim 26 depends.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 24-28 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the

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application was filed, had possession of the claimed invention. The term "isotropic coefficient of thermal expansion" has been added to claims 24-26. The specification and claims do not teach or suggest that the material must be isotropic. The specification and claims teach that the "wafer carrier is comprised of a material having a coefficient of thermal expansion that enables the upwardly inclined surface to maintain contact substantially entirely around the peripheral edge of the substrate during processing at elevated temperatures". This limit is broader than the added term "isotropic".

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1 and 8 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by McDiarmid, US Patent 5,242,501.

McDiarmid teaches a circular plate susceptor (wafer carrier) 16, 216, 316 that has a flat edge extending around the circumference of the plate, and a circular recess center region 220, 320 having a recessed bottom surface 222, 322 and including an upwardly inclined surface 221, 321 around the periphery of the recess bottom. The substrate is supported by a portion of the upwardly inclined surface and is spaced apart

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from the recessed bottom surface such that the substrate is supported by the wafer carrier only around the periphery edge of the substrate. The susceptor is made out of graphite, which has a coefficient of thermal expansion that enables the upwardly inclined surface to maintain contact substantially entirely around the peripheral edge of the substrate during processing at elevated temperatures, and a thermal conductivity of 40 to 70W/m/K. (Entire document)

5. Claims 1, 2, 5, and 8 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by MacLeish et al, US Patent 5,891,251.

MacLeish et al teaches a circular plate susceptor (wafer carrier) 50 that has a flat edge extending around the circumference of the plate; a circular recess center region having a recessed bottom surface 51c and including an upwardly inclined surface 51b around the periphery of the recess bottom; and a support member 54 to engage the substrate. The substrate is supported by a portion of the upwardly inclined surface and is spaced apart from the recessed bottom surface such that the substrate is supported by the wafer carrier only around the periphery edge of the substrate. The susceptor is made out of graphite, which has a coefficient of thermal expansion that enables the upwardly inclined surface to maintain contact substantially entirely around the peripheral edge of the substrate during processing at elevated temperatures, and a thermal conductivity of 40 to 70W/m/K. (Entire document)

Claim Rejections - 35 USC § 103

6. Claims 3, 4, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over McDiarmid.

McDiarmid was discussed above and also teaches that the dimensions of the susceptor can be optimized to fit a variety of size substrates, and the space between the substrate and susceptor can be optimized to control the heat flow from the susceptor to the substrate.

McDiarmid does not teach that the recess is 200 mm or 300 mm (to fit a 200 or 300 mm substrate), the space between the back of the substrate is between 0.15 mm to 0.5 mm, specifically, 0.25 mm, or that the susceptor is 5 to 25 mm thick.

The motivation for sizing the recess to a specific size is to hold a specific size substrate. The motivation for optimizing the size of the space between the substrate and the susceptor is to optimize the heat flow between the susceptor and the substrate. Both of which are taught by McDiarmid. The motivation for making the susceptor of McDiarmid 5 to 25 mm thick is to optimize the size of the susceptor. McDiarmid does not teach a dimension for the thickness of the susceptor. One of ordinary skill in the art would be motivated after reading McDiarmid to make the susceptor at an optimal size. Furthermore, it was held in *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), by the Federal Circuit that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. (Also see MPEP 2144.04 (d))

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention was made to: size the recess to 200 or 300 mm; size the space between the susceptor to 0.15 to 0.5 mm, specifically, 0.25 mm; and to size the thickness of the susceptor to 5 to 25 mm.

7. Claims 3-6 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacLeish et al.

MacLeish et al was discussed above. MacLeish et al does not disclose any dimensions in the drawings, specification, or claims.

McDiarmid does not teach that the recess is 200 mm or 300 mm (to fit a 200 or 300 mm substrate), the space between the back of the substrate is between 0.15 mm to 0.5 mm, specifically, 0.25 mm, the upwardly inclined surface is inclined at an angle of 5° to 45°, specifically, 10°, or that the susceptor is 5 to 25 mm thick.

One of ordinary skill in the art at the time the invention was made after reading the specification of MacLeish et al would be motivated to build the apparatus of MacLeish et al and find the optimum dimensions for each of the parts of the apparatus to ensure that the apparatus would function as taught by MacLeish et al. Furthermore, it was held in *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), by the Federal Circuit that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. (Also see MPEP 2144.04 (d))

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention was made to: size the recess to 200 or 300 mm; size the space between the susceptor to 0.15 to 0.5 mm, specifically, 0.25 mm; and to size the thickness of the susceptor to 5 to 25 mm.

8. Claims 1, 8, 9, and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grabmaier et al, US Patent 3,151,006 in view of McDiarmid.

Grabmaier et al teaches a flat polycrystalline silicon susceptor 1 for holding single crystal silicon substrates. (Figure 1)

Grabmaier et al differs from the present invention in that Grabmaier et al does not teach a circular plate susceptor (wafer carrier) that has a flat edge extending around the circumference of the plate; a circular recess center region having a recessed bottom surface and including an upwardly inclined surface around the periphery of the recess bottom, or that the substrate is supported by a portion of the upwardly inclined surface and is spaced apart from the recessed bottom surface such that the substrate is supported by the wafer carrier only around the periphery edge of the substrate.

McDiarmid was discussed above and further teaches that supporting a wafer on a flat surface causes the wafer to warp and introduces defects in to the layer. (Fig 3, col 2 line 60 through col 4 line 3)

The motivation for changing the shape of the susceptor of Grabmaier et al from a rod to a circle is to provide an alternate and equivalent shape of the susceptor. It has been held that a change in shape is a matter of choice, which a person of ordinary skill in the art would have found obvious. (See *In re Dailey*, 357 F.2d 669,149 USPQ 47

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(CCPA 1966) MPEP 2144.04 (d)) The motivation for adding the recess and supporting the substrate by its peripheral edge is to prevent the wafer from warping as taught by McDiarmid.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention was made to make the susceptor of Grabmaier et al round and to support the substrate in a recess by its peripheral edge to prevent the substrate from warping as taught by McDiarmid.

9. Claims 1, 9, and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al, US Patent 5,677,253 in view of McDiarmid.

Inoue et al teaches a round flat aluminum nitride susceptor 1 for holding a substrate (Entire document)

Inoue et al differs from the present invention in that Inoue et al does not teach a susceptor; a circular recess center region having a recessed bottom surface and including an upwardly inclined surface around the periphery of the recess bottom, or that the substrate is supported by a portion of an upwardly inclined surface and is spaced apart from the recessed bottom surface such that the substrate is supported by the wafer carrier only around the periphery edge of the substrate.

McDiarmid was discussed above and further teaches that supporting a wafer on a flat surface causes the wafer to warp and introduces defects in to the layer. (Fig 3, col 2 line 60 through col 4 line 3)

The motivation for adding the recess and supporting the substrate by its peripheral edge is to prevent the wafer from warping as taught by McDiarmid.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention was made to add the recess, and support the substrate by its peripheral edge to prevent warping as taught by McDiarmid.

10. Claims 3, 8, 9, 12 and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacLeish et al in view of Haafkens et al, US Patent 4,403,401.

MacLeish et al was discussed above.

MacLeish et al differs from the present invention in that MacLeish et al does not teach a 5 to 25 mm thick susceptor made of silicon carbide, aluminum nitride, silicon or silicon/silicon carbide alloy that holds a 200 mm wafer.

Haafkens et al teaches a 9 mm thick susceptor made of graphite with an aluminum nitride or silicon carbide layer for holding a 200 mm wafer. (Abstract, col 3 lines 27-30, claim 6)

The motivation for making the susceptor of MacLeish et al 9 mm thick is to provide a required but not disclosed dimension for the susceptor of MacLeish et al. The motivation for coating the susceptor of MacLeish et al with a layer of aluminum nitride or silicon carbide is to prevent the graphite susceptor from warping as taught by Haafkens et al. The motivation for making the recessed region about 200 mm is to hold a 200 mm wafer as taught by Haafkens et al.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the susceptor 9 mm thick, coat the susceptor of MacLeish et al with an aluminum nitride or silicon carbide layer, and make the recess 200 mm in diameter to hold a 200 mm substrate as taught by Haafkens et al.

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11. Claims 3, 8, 9, and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacLeish et al in view of Chen et al, US Patent 5,837,058

MacLeish et al was discussed above.

MacLeish et al differs from the present invention in that MacLeish et al does not teach a susceptor made of silicon carbide, aluminum nitride, silicon or silicon/silicon carbide alloy that holds a 200 mm wafer.

Chen et al teaches a susceptor made of graphite with an aluminum nitride layer for holding a 200 mm wafer.

The motivation for coating the susceptor of MacLeish et al with a layer of aluminum nitride is to protect the graphite from damage caused by chemical attack as taught by Chen et al. The motivation for making the recessed region about 200 mm is to hold a 200 mm wafer as taught by Chen et al.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to coat the susceptor of MacLeish et al with an aluminum nitride layer, and make the recess 200 mm in diameter to hold a 200 mm substrate as taught by Chen et al.

Response to Arguments

12. Applicant's arguments filed August 8, 2001 have been fully considered but they are not persuasive.

In regard to the arguments that the specification, drawings and claims support the addition of "isotropic" to the specification and claims, the examiner disagrees. The support claimed for this is that the specification teaches that: "(i) the substrate is

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supported around its periphery by a portion of the upwardly inclined surface of the wafer carrier; (ii) the wafer carrier is subject to thermal expansion during processing; and it is an object of the invention to provide a wafer carrier that prevents deposition on the backside of a substrate. These limitations do not limit the material of the wafer carrier to only an isotropic material, as the amended claims would suggest. A material that has the same thermal expansion in the support plane, so that the thermal expansion is even at the contact point, could meet these limitations. An example of such a material is graphite. The limitations could also be met by selecting the proper material of construction such that the thermal expansion of the wafer carrier material at the processing temperature is small enough to prevent any gaps from forming caused by thermal expansion. An example of this would be quartz or SiC in a low temperature process. Since the applicant did not originally disclose the "isotropic" limitation, and relied on a general description that included a plurality of possible solutions that met the requirements of the present invention, there is no evidence that the applicants intended the invention be limited to materials that were "isotropic". The examiner believes the limit was added to overcome the rejections based on the prior art.

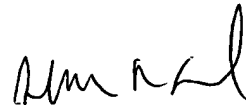
13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (703) 308-1796. The examiner can normally be reached on Monday-Thursday (6:30 am-6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703) 305-5408 for regular communications and (703) 305-3599 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Jeffrie R. Lund
Primary Examiner
Art Unit 1763

JRL
September 1, 2001